SHRI MATA VAISHNO DEVI UNIVERSITY, KATRA

Minor-I (Even Semester) – 2018-19

Entry No: 17BEC033

Total number of pages:[01]

Total number of questions: 04

B.Tech. || ECE || Sem IV

Linear Integrated Circuits & Applications (ECL-2030)

Time allowed: 1.5 Hr **Max Marks: 20**

Important Instructions:

- All questions are compulsory
- Sketch the schematics whenever necessary
- Assume any missing data

Q. 1 (a) Derive the expression for CMRR in a dual input balanced output differential amplifier. [3+1+1] CO1

(b) Note down four ideal characteristics of op-amp. CO2

(c) Draw and explain the voltage transfer characteristics of op-amp. CO2

Q. 2. (a) What is the difference between constant current bias and constant current source? [1+3+2] CO1

(b) Derive the expression of emitter resistance in Widlar current mirror. If I_{C1}=1.5 mA and I_{C2}=0.01 mA, then find out the value of emitter resistance. CO1

(c) Define the following terms: (a) Input bias current (b) Supply voltage rejection ratio CO2

Q. 3. (a) Why frequency compensation is necessary in op-amp for stable operation? [1+2+1] CO2

(b) A non-compensated op-amp has a dc gain of 120000 and the break frequencies at 30 KHz and 200 KHz. Write down the open loop gain equation for op-amp as a function of break frequencies. Also find out the operating frequency at which gain will be 30 dB. CO2

(c) For a noninverting feedback op-amp with a single break frequency has unity gain bandwidth product of 10 MHz and closed loop gain of 100. What is the value of closed loop gain at the break frequency? CO2

Q. 4. (a) Why negative feedback is necessary in an op-amp circuit? Derive the modified expression for basic parameters, affected by voltage series feedback op-amp circuit. [3+2] CO1

(b) If R_i=2 MΩ, R_O=60 Ω, R_1=2 K and R_F=30 K for IC 741 op-amp, then calculate the feedback parameters in a non-inverting op-amp. [consider all standard notations] CO1

Sl. No.	Course outcome	Q. No.	Total marks
1.	To understand the design concepts of Operational amplifier IC	1 (a), 2 (a, b), 4	12
2.	To understand the basic characteristics of op-amp	1 (b, c), 2 (c), 3	8

SHRI MATA VAISHNO DEVI UNIVERSITY, KATRA

Minor-II (Even Semester) – 2018-19

Entry No: | | | | | | | | | |

Total number of pages:[01]

Total number of questions: 04

B.Tech. || ECE || Sem IV

Linear Integrated Circuits & Applications (ECL-2030)

Time allowed: 1.5 Hr **Max Marks: 20**

Important Instructions:

- All questions are compulsory
- Sketch the schematics whenever necessary
- Assume any missing data

Q. 1. (a) Draw the circuit diagram and explain the working of a square wave generator. Also Design a square wave generator for 1 KHz frequency. [3+2] CO1

Q. 2. (a) Explain the working of a practical differentiator. Why it is beneficial over ideal differentiator. [3+2] CO1

(b) Design a practical differentiator with cutoff frequency of 8 KHz. CO1

Q. 3. (a) Drive the expression for output voltage of an instrumentation amplifier. [2+3] CO1

(b) Draw the circuit diagram and output waveform for each op-amp applications listed below. Assume 2 V peak and 1 KHz frequency sinusoidal signal as input for all applications. CO1

(a) Positive clipper (b) Sample & hold Circuit (c) Schmitt Trigger

Q. 4. (a) Determine the output voltage for the following 3 circuits shown in figure 1-3. Assume all standard notations. [2+2+1] CO1

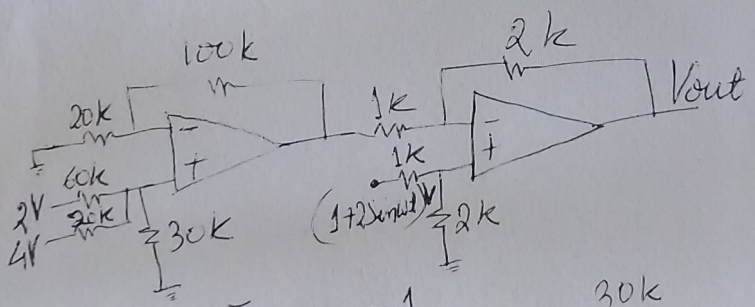

Figure - 1

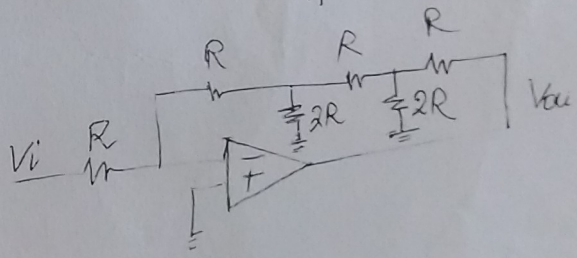

Figure - 2

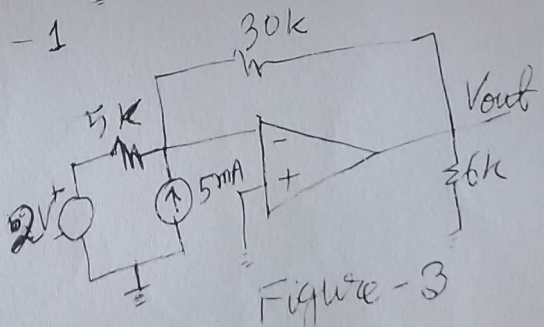

Figure - 3

Sl. No.	Course outcome	Q. No.	Total marks
1.	To be able to design some basic linear and nonlinear circuits using op-amp.	1 -4	20

SHRI MATA VAISHNO DEVI UNIVERSITY, KATRA

Major Examination (Even Semester) – 2018-19

Entry No: 17BEC033

Total number of pages:[02]

Total number of questions: [04]

B.Tech. || ECE || Sem IV

Linear Integrated Circuits & Applications

Subject Code: ECL-2030

Time allowed: 3 Hr

Max Marks: 50

Important Instructions:

- All questions are compulsory
- Assume any missing data
- Sketch schematics whenever needed

Q1. (i) Why op-amp circuits are specified as linear integrated circuits? [1×10 =10] [CO1]

(ii) Power supply rejection ratio of an ideal op-amp should be _____. [CO2]

(iii) The OP-AMP comparator circuit uses _____ feedback. [CO2]

(iv) The Schmitt trigger can be used as a _____ wave generator. [CO2]

(v) If the output of a particular op-amp increases 6 V in 8μs. The slew rate is _____ [CO3]

(vi) An op-amp has unity gain bandwidth product of 1.5 MHz for a signal of frequency 2 KHz. What is the open loop dc voltage gain? [CO3]

(vii) Specify the conditions necessary for generations of oscillation in electronic device. [CO4]

(viii) An integrator can be used as a _____ filter. [CO4]

(ix) Why Butterworth filters are commonly used? [CO4]

(x) Discharging path through _____ is followed by a 555 timer in monostable multivibrator mode. [CO5]

Q2. (a) Design the following circuits using op-amp and explain their working. [include waveform/graph, if needed] [2+4+4 +5=15]

(ii) Logarithmic Amplifier [CO2]

(iii) Triangular wave generator [CO2]

(iv) Wien bridge Oscillator [CO4]

(v) Double feedback narrow band pass filter [CO4]

(b) Show the following applications of op-amp with neat sketch of circuit diagram and corresponding waveform/graph: [1×5 =5]

(i) Scale changer (ii) Voltage limiter (iii) Phase shifter [CO2]

(iv) Narrow band reject filter (v) RC phase shift oscillator [CO4]

Q3. (a) What is the difference between Active and passive filters?

(b) What are the advantages of Active filters? [1+1+3 +3+2 =10] [CO4]

(c) Design a second order low pass Butterworth filter whose 3 dB cutoff frequency is 15 KHz. [CO4]

(d) With a suitable internal circuit diagram, explain the working of astable multivibrator designed using a 555 timer. [CO4]

(e) Calculate the duty cycle for the astable multivibrator output, if C= 0.01 μF, R_A=10 KΩ & R_B= 40 KΩ? [CO5]

[CO5]

Q4. (a) Find the DC analysis parameters [V_{CQ} & I_{CQ}] for differential amplifier as shown in Fig. 1. [2+2 +3+3 =10] [CO1]

(b) Two identical transistors with V_{BE} = 0.7 V is connected as shown in Fig. 2. Determine the output voltage V_0. [CO1]

(c) Find the values of currents as indicated in Fig. 3. [CO2]

(d) Design a RC phase shift oscillator for 10 KHz frequency of oscillation. [CO4]

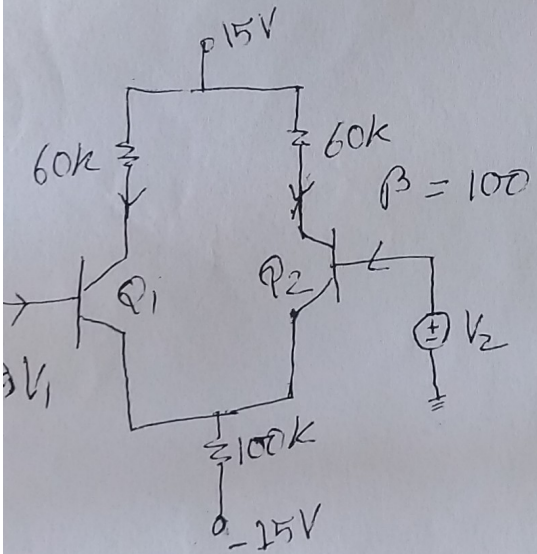

Figure - 1

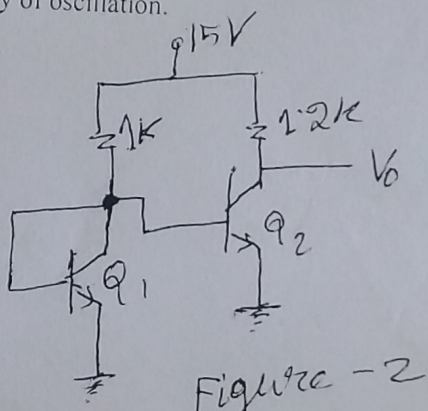

Figure - 2

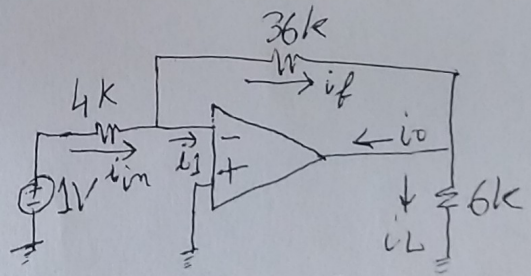

Figure - 3

Sl. No.	Course outcome	Q. No.	Total marks
1.	To understand the concept of differential amplifiers		5
2.	To understand the basics of Operational amplifiers and its applications		14
3.	To be able to perform the Frequency response analysis of Op-amp		2
4.	To be able to design active filters and oscillators using Op-amp		23
5.	To be introduced about some specialized IC applications of OP-amp		6